December 7, 2009

Addendum No. 2 to
Invitation for Bid for
Construction of the San Francisco-Oakland Bay Bridge
Toll Operations Building
Dated October 30, 2009

Dear Contractor:

This letter is Addendum No. 2 to the Invitation for Bid for Construction of the San-Francisco-Oakland Bay Bridge Toll Operations Building, dated October 30, 2009, as amended November 24, 2009 by Addendum 1. Where text is revised, deleted text is shown in strike-through format; added text is italicized. The IFB is revised as follows:

Addendum Item	Reference	Change(s)
1.	Section 014523, Testing and Inspection Services	Pages 014523-1 to 004513-20 are deleted and replaced in their entirety by Attachment A of this Addendum 2.
2.	Section 051200.1.2.B, Structural Steel Framing	1. ~~Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements. Section "TESTING AGENCY SERVICES" for information on required tests.~~ *Division 01 Sections "Quality Control" and "Testing and Inspection Services."*
3.	Section 051200.1.2.B, Structural Steel Framing	~~5. Division 05 Section "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.~~ 5. *Not used.*
4.	Demand Critical Welds, 051200.1.3.D, Structural Steel Framing	D. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System ~~and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings~~. *Demand critical welds in the structure are limited to the following locations:* *D.1. Welds of columns-to-base plates that are part of either end of a braced frame.*

JOSEPH P. BORT METROCENTER | 101 EIGHTH STREET | OAKLAND, CA 94607-4700
TEL 510.817.5700 | TTY/TDD 510.817.5769 | FAX 510.817.5848 | E-MAIL info@mtc.ca.gov | WEB www.mtc.ca.gov

Addendum Item	Reference	Change(s)
5.	Section 051200.2.5.B, Structural Steel Framing	3. Grind all welds smooth. *4. Architecturally Exposed Structural Steel components include the following elements and their connections:* *a. Columns supporting the entrance canopy.* *b. Header beams in the entrance canopy structure exposed to view in the final Work.*
6.	Source Quality Control, 051200.2.9, Structural Steel	~~A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements. Architect reserves right, at any time before final acceptance, to reject material not complying with specified requirements.~~ ~~1. Provide testing agency with access to places where structural steel work is being fabricated or produced to perform tests and inspections. Material to be used shall be made available so that each piece can be examined.~~ ~~2. Provide testing agency, architect, engineer and Owner 10 day's notice before commencing the fabrication of any structural steel.~~ ~~B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.~~ ~~C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."~~ ~~1. Direct-tension indicator gaps will be verified to comply with ASTM F 959, Table 2.~~ ~~D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:~~ ~~1. Liquid Penetrant Inspection: ASTM E 165.~~ ~~2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.~~ ~~3. Ultrasonic Inspection: ASTM E 164.~~ ~~4. Radiographic Inspection: ASTM E 94.~~ ~~5. Test 10% of fillet welds, 15% of partial penetration groove welds and 100% of complete penetration welds.~~ ~~E. The testing agency shall verify that all welders are certified and conduct inspections and tests as required. Record types and~~

		~~locations of defects found in work. Record work required and performed to correct deficiencies.~~ ~~F. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1/D1.1M for stud welding and as follows:~~ ~~1. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.~~ ~~2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.~~ ~~G. In addition to visual inspection, shop-welded shear connectors will be inspected and tested according to requirements of AWS D1.1 for stud welding. At the beginning of the composite stud application all studs shall be tested until the Inspector has determined that all voltage requirements and application techniques have satisfied the manufacturer's requirements and the Contract Documents. At this point a quality control testing procedure will be established and the testing will be done in accordance with the following:~~ ~~1. After welding, the ceramic ferrule should be removed from each stud and the weld fillet visually inspected. A fillet of less than 360 degrees, or welding repairs, is cause for further inspection. Such studs should be Bend tested, hammering the stud 15 degrees from the vertical toward the closest end of the embedment plate or steel member. Bending with-out failure indicates a satisfactory weld. Bent studs may be left bent.~~ ~~2. Tests will be conducted on additional shear connectors when weld fracture occurs on shear connectors already tested, according to requirements of AWS D1.1.~~ *A. Testing Agency: Owner may choose to engage a qualified independent testing and inspecting agency to provide additional shop inspections and quality assurance above and beyond the Contractor's quality control plans.* *B. Reference Section "014523 – Testing and Inspection Services" for information on shop tests and inspections that the Owner may choose to have performed.* *C. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.*
7.	Section 051200.3.6, Structural Steel Framing	B. Reference Section ~~"TESTING AGENCY SERVICES"~~ *"014523 – Testing and Inspection Services"* for information on required tests.
8.	Section 055000.1.1.A, Metal Fabrications	~~8. Steel framing and supports (outriggers) for window-washing equipment including mounting brackets and anchorages.~~ *8. Not used.*
9.	Section 074243.1.5, Composite Wall	~~C. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact joint sealants to joint-sealant~~

	Panels	~~manufacturers for testing indicated in subparagraphs below:~~ ~~1. Use manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.~~ ~~a. Perform tests under environmental conditions replicating those that will exist during installation.~~ ~~2. Submit no fewer than nine pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.~~ ~~3. Schedule enough time for testing and analyzing results to prevent delaying the Work.~~ ~~4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers~~ *C. Not used.*
10.	Section 077200.2.3.A, Roof Accessories	~~1. Basis of Design: Provide RSC(C) Roof Top Spring Curb by Mason Industries or approved equal.~~ *1. Not used.*
11.	Section 084423, Glazed Aluminum Curtain Walls	~~1.4 PRECONSTRUCTION TESTING~~ ~~A. Preconstruction Testing Service: Provide structural-sealant-glazed curtain walls that comply with test-performance requirements indicated, as evidenced by reports based on Project-specific preconstruction testing of tests performed on manufacturer's standard assemblies by a qualified testing agency.~~ ~~1. Engage a qualified testing agency to perform preconstruction testing on laboratory mockups.~~ ~~2. Build laboratory mockups at testing agency facility using personnel, materials, and methods of construction that will be used at Project site.~~ ~~3. Notify Architect seven days in advance of the dates and times when laboratory mockups will be constructed.~~ ~~4. Preconstruction Testing Program: Perform tests specified in "Performance Requirements" Article on laboratory mockups in the following order:~~ ~~a. Structural-performance preloading at 50 percent of specified wind-load design pressure when tested according to ASTM E 330.~~ ~~b. Air infiltration when tested according to ASTM E 283.~~ ~~c. Water penetration under static pressure when tested according to ASTM E 331.~~ ~~d. Water penetration under dynamic pressure when tested according to AAMA 501.1.~~ ~~e. Structural performance at design load when tested according to ASTM E 330.~~ ~~f. Repeat air filtration when tested according to ASTM E 283.~~

		~~g. Repeat water penetration under static pressure when tested according to ASTM E 331.~~ ~~h. Structural performance at maximum 150 percent of positive and negative wind-load design pressures when tested according to ASTM E 330.~~ ~~B. Preconstruction Sealant Testing: Perform sealant manufacturer's standard tests for compatibility with and adhesion of each material that will come in contact with sealants and each condition.~~ ~~1. Test a minimum five production-run samples each of metal, glazing, and other material.~~ ~~2. Prepare samples using techniques and primers required for installed assemblies.~~ ~~3. Perform tests under environmental conditions that duplicate those under which assemblies will be installed.~~ ~~4. For materials that fail tests, determine corrective measures necessary to prepare each material to ensure compatibility with and adhesion of sealants including, but not limited to, specially formulated primers. After performing these corrective measures on the minimum number of samples required for each material, retest materials.~~ *1.4 NOT USED*
12	Shop Drawings, Section 084423.1.5.C Glazed Aluminum Curtain Walls	~~3. Include laboratory mockup Shop Drawings, prepared by a qualified preconstruction testing agency, showing details of laboratory mockup.~~ ~~a. Resubmit Shop Drawings with changes made to details of structural-sealant-glazed curtain walls, to successfully complete preconstruction testing.~~ *3. Not used.*
13	Submittals, Section 084423.1.5, Glazed Aluminum Curtain Walls	~~H. Preconstruction Mockup Submittals:~~ ~~1. Preconstruction Testing Program: Developed specifically for Project.~~ ~~2. Preconstruction Test Reports: Prepared by a qualified preconstruction testing agency, for each mockup test.~~ ~~3. Photographs:~~ ~~a. Take a minimum of 20 photographs at locations and intervals as required by Architect.~~ ~~b. Submit digital color images on CD-R of mockup before, during, and after preconstruction testing.~~ ~~4. Record Drawings: Submit record drawings of preconstruction mockups prepared by preconstruction testing agency.~~ *H. Not Used* I. Qualification Data: For qualified Installer and ~~preconstruction testing agency and~~ testing agency.

14	Submittals, Section 084423.1.5, Glazed Aluminum Curtain Walls	M. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified ~~preconstruction~~ testing agency, for structural-sealant-glazed curtain walls, indicating compliance with performance requirements. ~~N. Preconstruction Test Reports: For structural-sealant-glazed curtain walls and elastomeric glazing sealants.~~ *N. Not used.*
15	Quality Assurance, Section 084423.1.6, Glazed Aluminum Curtain Walls	~~B. Preconstruction Testing Agency Qualifications: Qualified according to ISO/IEC 17025 and accredited by ICC-ES for preconstruction testing indicated.~~ *B. Not used.*
16	Section 230923, Direct Digital Control System for HVAC	~~1.2 PRE-BID REVIEW~~ ~~A. It is intended that all bids conform to this specification.~~ ~~B. Bidders to this specification shall be considered based on their compliance with these specifications and compliance with the associated mechanical drawings. Bidders may be considered if instructions for submitting a bid as outlined below are successfully accomplished and written approval is acknowledged by the Engineer as outlined in paragraph E below.~~ ~~C. All bidders shall provide a pre-bid COMPLIANCE DOCUMENT to BATA for engineering review and approval. The COMPLIANCE DOCUMENT is intended to determine if the bid is equal to the project drawings and specifications.~~ ~~D. The COMPLIANCE DOCUMENT shall be provided 14 days prior to the bid date. The engineer will provide a review and determine if the bid meets the requirements of the bid documents. The document shall include the following:~~ ~~1. Narrative general description of what system is being offered.~~ ~~2. The compliance document will indicate which of each paragraph in these specifications is either "Compliant", "Equal", "Exceeds", "Alternate", or "Not Provided". When any item is identified as "Compliant", no further information is needed. When any item is listed as "Equal", "Alternate", "Exceeds" or "Not Provide" the bidder will provide a description of what is offered. The comparison will fully describe what part of the specification is not being met and describe the intended equivalency.~~ ~~3. Drawings shall be provided to show the alternative method being offered as an equivalency to the mechanical bid drawings. A description will be provided showing which part of the drawing is not being met and what is being offered as an alternative.~~ ~~D. Engineer reserves the right to reject, at his option, any and all bids~~

		~~do not meet the specified requirements stated. Engineer will issue written approval to all approved bidders.~~ *1.2 NOT USED*
17	Section 283100.2.1, Fire Detection and Alarm	B. Product Description: Modular fire alarm control panel with ~~[flush]~~ [surface~~]~~ wall-mounted enclosure.
18	Section 283100.2.4, Fire Detection and Alarm	C. Furnish [two-wire detector with common~~]~~ ~~[four-wire detector with separate]~~ power supply and signal circuits.
19	Section 283100.2.5, Fire Detection and Alarm	B. Furnish [two-wire detector with common~~]~~ ~~[four-wire detector with separate]~~ power supply and signal circuits.

The remaining provisions of the IFB, dated October 30, 2009, as amended on November 24, 2009 by Addendum 1, remain unchanged. In the event of a conflict between this addendum and the previous version(s), this addendum shall take precedence.

Any questions concerning this addendum to the IFB should be directed to Stephen Wolf, Project Manager, at (510) 817-5968 or swolf@mtc.ca.gov.

Sincerely,

Steve Heminger
Executive Directors

SH: SW
J:\CONTRACT\Procurements\Public Works\IFBs\SFOBB Toll Ops\Addenda and QA\SFOBB TOB Addend2.doc

SECTION 014523 - TESTING & INSPECTION SERVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections apply to work specified in this Section.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.3 PROCEDURE

A. General: All inspections will be provided in accordance with the requirements of the 2007 California Building Code, as outlined herein in this specification, and as indicated on the structural drawings.

B. Contractors Responsibility: The Contractor shall remain fully responsible for the quality of all the Work. The Testing Agency's duties and responsibilities outlined herein in no way relieves the Contractor from responsibility of completing the work in compliance with the Contract Documents.

C. Independent Testing Agency: An independent testing agency will be selected by the Owner or his representative to inspect and test the materials and methods of construction as hereinafter specified for compliance with the specification requirements of the Contract Documents and to perform such other specialized technical services as may be required by the Owner or his representative.

1.4 QUALIFICATIONS OF TESTING AGENCY

A. The Testing Agency selected shall meet the basic requirements of ASTM E329 "Standard of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction" to conduct the testing indicated, as documented according to ASTM E 548.

B. The Testing Agency selected shall meet "Recommended Requirements for Independent Agency Qualification", latest edition, as published by the American Council of Independent Laboratories.

C. Testing machines shall be calibrated at intervals not exceeding 12 months by devices of accuracy traceable to the National Bureau of Standards or accepted values of natural physical constants.

D. Tests and inspections shall be conducted in accordance with specified requirements, and if not specified, in accordance with the applicable standards of the American Society for Testing and Materials or other recognized and accepted authorities in the field.

E. Concrete Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

2. Personnel conducting reinforcing inspection shall be qualified as ACI Concrete Construction Inspector or have comparable experience and education acceptable to the Engineer.

1.5 AUTHORITIES AND DUTIES OF THE AGENCY

A. Attending Preconstruction Conferences: The Independent Testing Agency will obtain and review the project plans and specifications with the Architect and Engineer as soon as possible prior to the start of construction. The Independent Testing Agency will attend preconstruction conferences relevant to testing and inspection services with the Architect, Engineer, Project Manager, General Contractor, and Material Suppliers to coordinate inspection and testing requirements with the planned construction schedule. The Independent Testing Agency will participate in such conferences throughout the course of the project as may be requested by the Owner.

B. Agency Contact: Prior to beginning work the Independent Testing Agency will notify the Owner, Architect, Engineer and Contractor of their responsible person in charge of the project testing and inspection. They will provide name, address phone and e-mail address. If during the course of the project any of this information changes they will notify all parties immediately.

C. Cooperation with Design Team: The Agency will cooperate with the Architect, Engineer, and Contractor and provide qualified personnel promptly on notice.

D. The Agency will perform the required inspections, sampling, and testing of materials as specified under each section and observe methods of construction for compliance with the requirements of the Contract Documents.

E. Notification of Deficiencies in the Work: When deficiencies are discovered while on site the Testing Agency will notify the contractor immediately of these deficiencies. The Agency will notify the Architect, Engineer, Owner and Contractor, within 48 hours of discovery by telephone or e-mail and then in writing of observed irregularities and deficiencies of the work and other conditions not in compliance with the requirements of the Contract Documents.

F. Reports:

1. Information on Reports: The Agency will submit copies of all reports of inspections and tests promptly and directly to the parties named below. All reports will contain at least the following information:

a. Project Name
b. Date report issued

c. Testing Agency name and address
d. Name and signature of inspector
e. Date of inspection and sampling
f. Date of test
g. Identification of product and Specification section
h. Location in the project
i. Identification of inspection or test
j. Record of weather conditions and temperature (if applicable)
k. Results of test regarding compliance with Contract Documents

2. Copies: The Agency will send certified copies of test and inspection reports to the following parties:

a. 3 copies to the Owner or his representative
b. 2 copies to the Owner's Architect/Engineer
c. 2 copies to the General Contractor

G. Error Log: The Owner's Representative will maintain an "Error Log" listing each observed incident of non-compliant construction and non-compliant test results. This log will indicate all steps taken to bring the construction to compliance with the contract documents or approvals given of non-compliant construction. No non-compliant construction incident will be noted as closed until it has been made to comply with the construction documents or until the testing agency has received written approval of the non-compliant construction as built by the architect/engineer.

H. Accounting: The Testing Agency will be responsible for separating and billing costs attributed to the Owner and costs attributed to the Contractor.

I. Shop Drawings, Submittals, Product and Material Certifications: The Testing Agency will utilize the approved shop drawings and submittals obtained from the Owner's Representative (as specified herein) during the course of their inspections. .

J. Limitations of Authority: The Testing Agency is not authorized to revoke, alter, relax, enlarge upon, or release any requirements of the Specifications or to approve or accept any portion of the work or to perform any duties of the General Contractor and his Subcontractors.

1.6 CONTRACTORS RESPONSIBILITY

A. Cooperation with Owner The Contractor shall cooperate with agency personnel; provide access to the work and to manufacturers operations for both field and shop inspections at no additional cost.

B. Furnishing Samples: The Contractor shall provide to the agency representative, samples of materials proposed for use in the work in quantities sufficient for accurate testing as specified.

C. Furnish Shop Drawings and Submittals: The Contractor shall furnish one copy of all approved shop drawings and submittals for all materials and construction to be inspected and/or tested.

D. Furnishing Casual Labor, Equipment and Facilities: The Contractor shall furnish casual labor, equipment, and facilities as required for sampling and testing by the agency and otherwise facilitate all required inspections and tests.

E. Advance Notice: The Contractor shall be responsible for notifying the Testing Agency sufficiently in advance of operations, a minimum of 48 hours, to allow for assignment of personnel and scheduling of tests.

F. Deficiencies: When irregularities or deficiencies are discovered by the contractor or when the contractor is notified of such by the testing agency the contractor shall immediately stop deficient work. This includes, but is not limited to, non-compliant soil preparation, concrete, reinforcing steel placement, post-tension strand placement and stressing operation, finishing procedures, steel erection and welding. The contractor shall immediately notify the architect/engineer and provide a full description of the deficiency and the contractor's proposed remedy. Proposed remedies shall include adequate drawings and calculations to clarify and justify his proposal. The contractor shall not proceed with the defective work until the architect/engineer has approved the contractor's proposed remedy and corrective measures.
Payment for Substitution Testing: The Contractor shall arrange with the Testing Agency and pay for any additional samples and tests above those required by the Contract Documents as requested by the Contractor for his convenience in performing the work.

G. Payment for Retesting: The Contractor shall pay for any additional inspections, sampling, testing, and retesting as required when initial tests indicate work does not comply with the requirements of the Contract Documents.

H. Payment by Contractor: The Contractor shall furnish and pay for the following items:

1. Soil survey of the location of borrows soil materials, samples of existing soil materials, and delivery to the Testing Agency.
2. Concrete mix designs as prepared by his concrete supplier or by his Testing Agency.
3. Concrete coring, tests of below strength concrete, and load tests, if ordered by the Owner, Architect, or Engineer.
4. Certification of welders.
5. Tests, samples, and mock-ups of substitute material where the substitution is requested by the Contractor and the tests are necessary in the opinion of the Owner, Architect or Engineer to establish equality with specified items.
6. Any other tests when such costs are required by the Contract Documents to be paid by the Contractor.

I. Notification of Source Change: The Contractor shall be responsible for notifying the Owner, Architect, Engineer, and Testing Agency when the source of any material is changed after the original tests or inspections have been made.

J. Tests for Suspected Deficient Work: If in the opinion of the Owner, Architect, or Engineer any of the work of the Contractor is not satisfactory, the Contractor shall make all tests that the Owner, Architect, or Engineer deem advisable to determine its proper construction. The Owner will pay all costs if the tests prove the questioned work to be satisfactory.

1.7 PAYMENT OF TESTING AGENCY

The Owner will pay for the Testing Agency services for testing of materials for compliance with the requirements of the Contract Documents. The Contractor will be back-charged for additional testing and retesting of materials that do not comply with the requirements of the Contract Documents and all other items as specified in these Specifications.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 SCOPE OF WORK

The work to be performed by the Testing Agency will be as specified in this Section of the Specification and as determined in meetings with the Owner, Architect, and Engineer.

3.2 EARTHWORK

A. Refer to specification section regarding Earthwork, and Structural Drawings and General Notes on the drawings.

3.3 REINFORCING STEEL

A. Visual Inspection of Material: The Independent Testing Agency will inspect the shipment to determine the following:

1. The bars shall be free from injurious defects and shall have a workman-like finish.
2. Deformations shall be of the proper sizes, shapes, and spacing as detailed in ASTM A-615 and ASTM A-706.
3. The bars shall not have excessive rust and/or pelting.
4. The bars shall not have any unusual twists or bends.

B. Visual Inspection of Mild Reinforcing Placement:

1. Inspect for proper mild steel reinforcing bar grade, size and location based on the contract documents. Verify that placement of reinforcing and location in forms will provide the specified concrete cover.

C. The testing agency will submit the following information in their regular inspection reports in addition to that listed in section 1.5 G:

1. Fabricator’s name.
2. Inspection location within the structure.
3. Observations of mild steel materials as required above.

D. Deficiencies: Observed deficiencies in placement of reinforcement shall be corrected by the Contractor prior to placement of concrete. Exposed reinforcing steel in finished work, indicating the bars are not properly located, will be sufficient cause for the rejection, removal and replacement of the concrete section.

3.4 CONCRETE MATERIALS AND CAST IN PLACE CONCRETE

A. Contractor's Testing Agency: Reference specifications section 033000 for testing and inspection to be provided by the Contractor’s Testing Agency both prior and during construction.

B. Independent Testing Agency: Independent testing and inspecting agency will sample materials, perform tests, inspect reinforcement and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this article.

C. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture less than 50 cu. yd.(38 cu. m), plus one set for each additional 50 cu. yd.(38 cu. m) or fraction thereof.

    a. When frequency of testing will provide fewer than three compressive-strength tests for each concrete mix, testing shall be conducted from at least three randomly selected batches or from each batch if fewer than three are used.

2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content for air-entrained concrete: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix. In addition, when air entrained concrete is used, the first batch of each placement shall be tested for air content at the Project.

    a. Sample fresh concrete immediately following placement and screeding at rate of one per every 10 truckloads of ready-mix, air-entrained concrete delivered to Project.

4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Unit Weight for lightweight concrete: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix
6. Compression Test Specimens: ASTM C 31; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.

    a. Each cylinder shall be marked with job name, location of placement, date of placement, slump, mix number and strength of concrete specified. In addition, the air content shall be marked on the cylinder where an air-entraining admixture is specified.
    b. Maintain cylinders at 60-80 deg F and protect from loss of moisture at the job site for a period not over 48 hours, then deliver to the laboratory for curing and testing.
    c. For curing cylinders, Contractor shall provide covered box large enough to contain eight standard concrete cylinders. At temperatures below 60 deg F box shall be electrically heated to maintain inside temperatures of 60 deg to 80 deg F. Cylinders shall be placed in box immediately after molding and shall be covered with moist burlap until delivery to laboratory.

7. Compressive-Strength Tests: ASTM C 39; test one specimen at 7 days, test two laboratory-cured specimens at 28 days, and one specimen held in reserve for testing at 56 days, if required.

    a.
    b. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28-days.

D. Fly ash and Blast Furnace Slag shall be sampled and tested by ASTM C 311 method. The Independent Testing Agency will make chemical analysis tests of fly ash made at regular intervals through-out the period of concrete placement. Contractor will supply samples of ash for testing as requested. Any variation of chemical composition of fly ash properties will be cause for rejection and/or removal of all concrete which contains rejected fly ash.

E. Evaluation and Acceptance of Concrete Strength Tests:

1. Acceptance Criteria: The strength level of an individual class of concrete shall be considered satisfactory if both of the following requirements are met:

    a. The average of all sets of three consecutive strength tests equal or exceed the required f'c.
    b. No individual strength test (average of two 28 day cylinder breaks) falls below the required f'c by more than 500 PSI.

2. If either of the above requirements is not met, the Testing Agency will immediately notify the Engineer by telephone. Steps shall immediately be taken by the Contractor to increase the average of subsequent strength tests.

F. Test results will be reported in writing to Engineer/Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests will contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in the Work, design compressive strength at 28 days, , concrete mix designation type and class, compressive breaking strength, and type of break for both 7-and 28-day tests.

G. Architect/Engineer has the authority to order, for any concrete, an increase in cement content or mix redesign for remaining work if either:

1. Average 7-day strength of any two tests representing a particular design strength is less than 55% of specified strength; OR.
2. Average 28-day strength of any two tests representing particular design strength is less than 90% of specified strength.

H. Investigation of Low Strength Concrete Test Results:

1. Contractor Responsibility for Low Strength Concrete: If any strength test of Agency cured cylinders falls below the required f'c by more than 500 psi, the Contractor shall take steps immediately to assure that the load carrying capacity of the structure is not jeopardized.
2. Core Tests: If the likelihood of low strength concrete is confirmed and computations indicate that the load carrying capacity of the structure has been significantly reduced, tests of cores by the Independent Testing Agency, drilled from the area in question under the direction of the Engineer, will be required in accordance with ASTM C42 "Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete". In such case, three cores will be taken for each strength test more than 500 PSI below required f'c. If concrete in the structure will be dry under service conditions, cores shall be air dried (temperature 60° to 80°F, relative humidity less than 60 percent) for 7 days before test and shall be tested dry. If concrete in the structure will be more than superficially wet under service conditions, cores shall be immersed in water for at least 48 hours and tested wet. The Contractor shall fill all holes made by drilling cores with an approved drypack concrete.

3. Acceptance Criteria for Core Tests: Concrete in an area represented by core tests will be considered structurally adequate if the average of three cores is equal to at least 85% of f'c and if no single core is less than 75% of f'c. If approved by the Engineer, locations of erratic core strengths may be retested to check testing accuracy.
4. Cost of Investigations for Low Strength Concrete: The costs of all investigations of low strength concrete shall be borne by the Contractor.

I. Additional Tests: Testing and inspecting agency will make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, unit weight for lightweight concrete, or other requirements have not been met, as directed by Engineer/Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

J. The Contractor may, at his own option and expense, prepare and test such additional cylinders he deems necessary to determine compressive strength of concrete to allow form removal.

K. Initial Concrete Batch Plant Inspection:

1. Inspection of Batch Plant Facilities: Prior to the start of concrete work, the Owner may choose to have the Independent Testing Agency inspect batch plant facilities proposed for use in the work, and report in writing the inspection results to the Architect, Engineer, and Owner for approval before the start of the work. The inspection will follow the outline in ASTM C94 and as recommended by the National Concrete Ready Mix Association. These inspections may include some or all of the following:

    a. Batch Plant operations and equipment
    b. Truck mixers
    c. Scales
    d. Stockpile placement
    e. Material storage
    f. Admixture dispensers

2. Duties of Inspector: The duties of the batch plant inspector will include the following:
    a. Perform initial inspection of batch plant facilities as specified above.
    b. Perform visual inspection of aggregates stockpiles to determine uniformity, cleanliness, and moisture variation to be performed each visit to the plant facility.
    c. Inspect aggregate conveying system for possible segregation to be performed at each visit.
    d. Observe batching procedure at each visit. Verify that concrete mix design number is being batched and randomly monitor weighing operation for correct weights of each mix ingredient, including admixture dosages.
    e. Prior to loading the truck at the batch plant verify that the drum is free of water, fresh concrete, or aggregates. Check conditions and cleanliness of drum, fins, and blades.
    f. During loading, observe loading procedures.
    g. After loading, hold the truck for proper mix time and inspect concrete for thorough mix and consistency prior to leaving the batch plant.
    h. Check size of batch for rated truck capacity.

L. Job Site Inspection: The scope of the work to be performed by the inspector on the jobsite will be as follows:

1. Reinforcement: Observed deficiencies in placement of reinforcement shall be corrected by the Contractor prior to placement of concrete. Exposed reinforcing steel in finished work, indicating the bars are not properly located, will be sufficient cause for the rejection, removal and replacement of the concrete section.
2. Embeds: Inspect anchor rods, bolts and embed assemblies to verify correct type, size and location.
3. Verify that air temperatures at the point of placement in the structure are within acceptable limits defined in material specification prior to ordering of concrete by the Contractor.
4. Inspect concrete upon arrival to verify that the proper concrete mix number, type of concrete, and concrete strength is being placed at the proper location.
5. Inspect plastic concrete upon arrival at the jobsite to verify proper batching. Observe mix consistency and adding of water as required to achieve target slumps in mix designs. Record the amount of water added and note if it exceeds that allowed in the mix design. The responsibility for adding water to trucks at the job site shall rest only with the Contractor's designated representative. The Contractor is responsible that all concrete placed in the field is in conformance to the Contract Documents.
6. Obtain concrete test cylinders.
7. Perform slump tests and air entrainment tests.
8. Record information for concrete test reports.
9. Verify that all concrete being placed meets job Specifications. Report concrete not meeting the specified requirements and immediately notify the Contractor, Batch Plant Inspector, Architect, Engineer, and Owner.
10. Pick up and transport to Laboratory any cylinders cast the previous day.
11. Check concrete placing techniques to determine that concrete deposited is uniform and that vertical drop does not exceed six feet.
12. The job site inspector will report any irregularities that occur in the concrete at the job site or test results to the Contractor, Architect, Owner, and Engineer.

M. Causes for Rejection of Concrete: The Contractor is responsible that all concrete placed in the field is in conformance to the Contract Documents. The Contractor shall reject all concrete delivered to the site for any of the following reasons:

1. Wrong class of concrete (incorrect mix design number).
2. Concrete with temperatures exceeding 95°F may not be placed in the structure.
3. Air contents outside the limits specified in the mix designs for air entrained concrete.
4. Slumps outside the limits specified in the mix designs.
5. Excessive Age: Concrete shall be discharged within 90 minutes of plant departure or before it begins to set if sooner than 90 minutes unless approved by the Owner’s representative.

N. Defective Work: Concrete work which does not conform to the specified requirements, including strength, tolerances and finishes, shall be corrected at the Contractor's expense, without extension of time therefore. The Contractor shall be responsible for the cost of corrections to any other work affected by or resulting from corrections to the concrete work.

O. Acceptance of Structure (ACI 301, 1.7):

1. Acceptance of completed concrete Work shall be according to provisions of ACI 301, 1.7.

P. Concrete Batch Trip Tickets: All concrete batch trip tickets shall be collected and retained by the Contractor. Compressive strength, slump, air, and temperature tests shall be identified by

reference to a particular trip ticket. All tickets shall contain the information specified in ASTM C 94. Each ticket shall also show the amount of water that may be added in the field for the entire batch that will not exceed the specified water cement ratio for the design mix. The Design Build Contractor and Owner's Testing Agency will immediately notify the Architect/Engineer and each other of tickets not meeting the criteria specified.

Q. Curing Methods: Inspect curing of all concrete and verify compliance with specification.

R. The Owner may choose to have the floor slab flatness and levelness measured according to ASTM E 1155, or according to the specified straightedge techniques as specified, within 48 hours of finishing.

3.5 PRECAST CONCRETE PILES AND SPLICES

A. Refer to specification section “316213 – Precast Concrete Piles” for additional geotechnical inspection requirements related to field installation of pile foundations. Refer to subsequent paragraphs below for requirements related to inspection of precast pile components.

B. The Owner may choose to provide shop inspections of precast concrete piles.

C. Contract Obligations:

1. Contractor Responsibility: The Contractor shall pay for and arrange with the Testing Agency for the certification of all shop and field welders. Each bolting crew and welder shall be assigned an identifying symbol or mark and all shop and field connections shall be so identified so that the inspector can refer back to the person or crew performing the work. The costs of all retesting of material or workmanship not in conformance with the Contract Documents shall be borne by the Contractor. The Fabricator and Erector shall provide the Agency inspector with access to all places where work is being done. A minimum of 48 hours notification shall be given prior to commencement of work. The Contractor shall provide the Testing Agency with the following:

    a. A complete set of Architect/Engineer reviewed shop and erection drawings including all revisions and addenda.
    b. Cutting lists, order sheets, material bills, shipping bills and mill test reports.
    c. Full and ample means and assistance for testing all material.
    d. Proper facilities, including scaffolding, temporary work platforms, hoisting facilities, etc., for inspection of the work in the mills, shop and field.

2. Testing Agency Responsibility:

    a. The Owner may choose to inspect the shop fabrication.
    b. The inspection of shop work by the Testing Agency will be performed in the Fabricator's shop to the fullest extent possible. Such inspections will be in sequence, timely, and performed in such a manner as to minimize disruptions in operations and to permit the repair of all nonconforming work while the material is in process in the fabricating shop.
    c. Inspection of field work will be completed promptly so that corrections can be made without delaying the progress of the work. Inspections will be performed by qualified technicians with a minimum of two years experience in precast concrete testing and inspection. All inspection personnel will be certified in accordance with AWS QC-1, ASTM C 1007 and ASTM E 329.

d. The Testing Agency will provide test reports of all shop and field inspections. All test reports will indicate types and locations of all defects found during inspection, the measures required and performed to correct such defects, statements of final approval of all grouting, welding and bolting of field connections, and other fabrication and erection data pertinent to the proper grouting, welding and bolting of shop and field connections. In addition to the parties listed in this Specification the Fabricator and Erector will receive copies of all test reports.

3. Rejection of Material or Workmanship: The Owner, Architect, Engineer, and Testing Agency reserve the right to reject any material or workmanship not in conformance with the Contract Documents at any time during the progress of the work. However, this provision does not allow waiving the obligation for timely, in sequence inspections.

D. Shop Inspections and Tests: The Owner may choose to engage the Testing Agency to provide inspection at the designated fabrication shops to evaluate the fabricator's quality control and testing methods meet the requirements of PCI MNL 116. The designated fabrication shops and time periods of inspection will be determined in consultation with the Architect, Owner, and Engineer prior to the start of fabrication in a timely manner so as to not delay the fabrication process.

1. Testing: If there is evidence that the strength of precast concrete units may be deficient or may not comply with PCI MNL 116 requirements, Contractor shall employ an independent testing agency, at the contractors expense, to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42.

a. A minimum of three representative cores will be taken from units of suspect strength, from locations directed by Architect.
b. Cores shall be tested, after immersion in water, in a wet condition per ACI 301 if units will be wet under service conditions.
c. Retain subparagraph above or below depending on in-service conditions.
d. Cores shall be tested in an air-dry condition per ACI 301 if units will be dry under service conditions.
e. PCI's recommendations below are more stringent than ACI's.
f. Strength of concrete for each series of 3 cores shall be considered satisfactory if the average compressive strength is equal to at least 85 percent of the 28-day design compressive strength and no single core is less than 75 percent of the 28-day design compressive strength.
g. Test results will be made in writing on the same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports will include the following:

1) Project identification name and number.
2) Date when tests were performed.
3) Name of precast concrete fabricator.
4) Name of concrete testing agency.
5) Identification letter, name, and type of precast concrete unit or units represented by core tests; design compressive strength; type of break; compressive strength at break, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

E. Field Inspections and Tests: The Testing Agency will provide inspection in the field for a period of time as determined in consultation with the Architect, Owner, and Engineer prior to the start of erection in a timely manner so as to not delay the start of erection. The costs of repairing all defective welds and the costs of retesting by the Testing Agency shall be borne by the Contractor. If removal of a backing strip is required by the Testing Agency to investigate a suspected weld defect, such cost shall be borne by the Contractor. The following tests and inspections will be made:

1. Obtain the planned erection procedure, and review with the Erectors supervisory personnel.
2. Verify field welding procedures and obtain welder certificates.
3. Check precast components as received in the field for possible shipping damage, workmanship, and piece marking.
4. Verify all loose connection components meet required material specification and has proper protective coating as specified.
5. As erection proceeds verify that embedded plates and anchorages align adequately to allow for proper placement and welding of connection material.
6. As erection proceeds verify that embedded items for anchorage to cast-in-place concrete are correctly located to allow anchorage in cast-in-place concrete to have specified concrete cover all around. Verify that sliding inserts are located so that there is adequate room in the insert to slide in both directions after the anchorage is correctly placed.
7. Check preheating to assure proper temperature, uniformity, and thoroughness through the full material thickness.
8. Review welding sequence.
9. Visually inspect all field welding for size, length, and quality. Visually inspect the concrete area around weldments for cracks or damage after welding.
10. Perform nondestructive examination services for various weldments of field erection determined in consultation with the Structural Engineer prior to the start of erection. The Agency will furnish a qualified technician with the necessary equipment to perform radiographic, ultrasonic, magnetic particle, or dye penetrant inspection as required for the item being tested and other duties as outlined for shop inspection in the previous Section. Unless specified otherwise, check all partial and complete penetration welds in connections of beams, girders, columns, and braces. Visual inspection is required for all fillet welds.

3.6 STRUCTURAL STEEL

A. Contract Obligations:

1. Contractor Responsibility: The Contractor shall arrange with the Independent Testing Agency for the certification of all shop and field welders. Each bolting crew and welder shall be assigned an identifying symbol or mark and all shop and field connections shall be so identified so that the inspector can refer back to the person or crew performing the work. The costs of all retesting of material or workmanship not in conformance with the Contract Documents shall be borne by the Contractor. The Fabricator and Erector shall provide the Agency inspector with access to all places where work is being done. A minimum of 48 hours notification shall be given prior to commencement of work. The Contractor shall provide the Testing Agency with the following:

   a. A complete set of Architect/Engineer reviewed shop and erection drawings including all revisions and addenda.
   b. Cutting lists, order sheets, material bills, shipping bills and mill test reports.

c. Information as to time and place of all rollings and shipment of material to shops.
d. Representative sample pieces requested for testing.
e. Full and ample means and assistance for testing all material.
f. Proper facilities, including scaffolding, temporary work platforms, hoisting facilities, etc., for inspection of the work in the mills, shop and field.

2. Testing Agency Responsibility:

a. The inspection of shop work by the Independent Testing Agency will be performed in the Fabricator's shop to the fullest extent possible. Such inspections will be in sequence, timely, and performed in such a manner as to minimize disruptions in operations and to permit the repair of all nonconforming work while the material is in process in the fabricating shop.
b. Inspection of field work will be completed promptly so that corrections can be made without delaying the progress of the work. Inspections will be performed by qualified technicians with a minimum of two years experience in structural steel testing and inspection. All inspection personnel will be certified in accordance with AWS QC-1.
c. The Testing Agency will provide test reports of all shop and field inspections. All test reports will indicate types and locations of all defects found during inspection, the measures required and performed to correct such defects, statements of final approval of all welding and bolting of shop and field connections, and other fabrication and erection data pertinent to the safe and proper welding and bolting of shop and field connections. In addition to the parties listed in this Specification the Fabricator and Erector will receive copies of all test reports.

3. Rejection of Material or Workmanship: The Owner, Architect, Engineer, and Testing Agency reserve the right to reject any material or workmanship not in conformance with the Contract Documents at any time during the progress of the work. However, this provision does not allow waiving the obligation for timely, in sequence inspections.

B. Shop Inspections and Tests: The Owner may choose to have the Independent Testing Agency provide inspections at the designated fabrication shops for designated periods of time to perform shop inspection and tests. The designated fabrication shops and time periods of inspection will be determined in consultation with the Architect, Owner, and Engineer prior to the start of fabrication in a timely manner so as to not delay the fabrication process. The following tests and inspections will be performed:

1. Review shop drawings and shop procedures with Fabricator's supervisory personnel.
2. Request and obtain necessary mill certifications of steel and verify proper material throughout the duration of the job.
3. Request and obtain necessary mill certifications of steel and verify proper material throughout the duration of the job.
4. Verify welder qualifications either by certification and/or by retesting. Obtain welder certificates.
5. Check layout and dimensions of jigs and fixtures for multiple fabrication, joint preparation, and fit up of members.
6. Verify welding electrodes to be used and other welding consumables as the job progresses.
7. Check preheating procedures for uniformity and thoroughness through the full thickness of the material. Inspect preheating and interpass temperatures for comformance to AWS D1.1, Table 4.2. Verify procedure for control of distortion and shrinkage stresses.

8. Verify procedures for welding in accordance with applicable portions of Section 4, "Technique", AWS D1.1.
9. Inspect welding equipment for capacity, maintenance, and working condition.
10. Perform random dimensional checks of completed members.
11. Provide inspection of surface preparation for coating and coating operations.
12. Check shipping preparation schedules and obtain copies of shipping lists.
13. Check bolted connections according to inspection procedures outlined in the "Specification for Structural Joints" using ASTM A325 or A490 Bolts.
14. Make visual inspection of welding in progress for size, length, and quality.
15. Perform non-destructive examination services for various weldments of shop fabrication determined in consultation with the Structural Engineer prior to the start of fabrication. The testing agency will submit recommendations to the Structural Engineer for approval as to the type of nondestructive inspection methods best suited to the member being tested. Specifically, the Agency will provide a qualified technician with the necessary equipment to perform the following:

    a. Nondestructive examination conducted in accordance with the specific requirements for the item being examined including radiographic, ultrasonic, magnetic particle, or dye penetrant inspection. All nondestructive inspection procedures shall conform to Section 6 of AWS D1.1.

        1) Liquid Penetrant Inspection: ASTM E 165.
        2) Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
        3) Ultrasonic Inspection: ASTM E 164.

    b. Interpret, record, and report all results of the nondestructive tests.
    c. Mark for repair, any area not meeting Specification requirements. Correction of rejected welds shall be made in accordance with Paragraph 3.7, "Corrections", AWS D1.1.
    d. Re-examine all repair areas and interpret, record, and report the results of examinations of repair welds.
    e. Verify that quality of welds meet the requirements of Paragraph B.15, Quality of Welds", AWS D1.1.

16. Visually inspect for laminations before and after welding all joints (regardless of plate thickness) where material is subjected to tension in the thru-thickness direction. Perform ultrasonic inspection on all welded moment joints with Group 3, 4 or 5 rolled shapes and with built-up sections containing plates 1 1/2" thick and greater, for a distance of two times the thickness of the plate receiving the thru-thickness tension either side of the plate delivering the tension. Refer to Specification Section 051200.

17. Unless otherwise specified, test all partial and complete penetration welds in connections of beams, girders, columns, trusses, and braces. Test a minimum of 10% of connections with fillet welds. Increase the testing rate for welders having a high rejection rate as required to ensure acceptable welds. Visual inspection is required for all fillet welds. The costs of repairing all defective welds and the costs of retesting by the Independent Testing Agency shall be borne by the Contractor. If removal of a backing strip is required by the Testing Agency to investigate a suspected weld defect, such cost shall be borne by the Contractor.

C. Field Inspections and Tests: The Independent Testing Agency will provide inspection in the field for a period of time as determined in consultation with the Architect, Owner, and Engineer prior to the start of erection in a timely manner so as to not delay the start of erection. The costs of repairing all defective welds and the costs of retesting by the Independent Testing Agency shall be borne by the Contractor. If removal of a backing strip is required by the Independent Testing Agency to investigate a suspected weld defect, such cost shall be borne by the Contractor. The following tests and inspections will be made:

1. Obtain the planned erection procedure, and review with the Erectors supervisory personnel.
2. Check the installation of base plates for grout type, and grout application.
3. All welding inspections shall be conducted in accordance with the quality assurance requirements in AISC's "Seismic Provisions for Structural Steel Buildings". Verify field welding procedures and obtain welder certificates.
4. Check steel as received in the field for possible shipping damage, workmanship, and piece marking.
5. Check joint preparation and fit up, backing strips, and runout plates for welded moment connections and column splices.
6. Check preheating to assure proper temperature, uniformity, and thoroughness through the full material thickness.
7. Review welding sequence.
8. Visually inspect all field welding for size, length, and quality.
9. Perform nondestructive examination services for various weldments of field erection determined in consultation with the Structural Engineer prior to the start of erection. The Agency will furnish a qualified technician with the necessary equipment to perform ultrasonic, magnetic particle, or dye penetrant inspection as required for the item being tested and other duties as outlined for shop inspection in the previous Section. Unless specified otherwise, check all partial and complete penetration welds in connections of beams, girders, columns, and braces. Check 10% of connections with fillet welds. Visual inspection is required for all welds.
10. Check calibration of impact wrenches used in field bolted connections.
11. Check high strength field bolted connections according to inspection procedures outlined in the "Specification for Structural Joints Using ASTM A325 or A490 Bolts", along with AISC's "Seismic Provisions for Structural Steel Buildings". Observe all pre-installation verification testing required for each bolt connection type, and observe subsequent installation procedures. Verify faying surfaces of each slip critical connection prior to installation. Unless specified otherwise, test 10% of the bolts, but not less than two bolts, selected at random in each pre-tensioned or slip-critical connection. If any bolt is found to be improperly tightened, test all bolts in the connection. Visually inspect all bearing type bolts to verify that the bolts are snug tight.
12. Visually inspect the fastening of metal deck to the steel structure. Visually inspect side lap connections. Provide proof-load testing on a random sampling of not less than 10% of any powder-actuated fasteners used for connection of metal decking.
13. Perform field tests on 10% of completed shear connectors in each beam according to inspection procedures outlined in AWS D1.1.

    a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
    b. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

14. Owner may choose to test guard rails per ASTM E 935 and shown to meet the loading requirements of this specification and the IBC.

3.7 NON-SHRINK GROUT FOR BASE PLATES AND BEARING PLATES

A. Compressive Strength Tests (by the Independent Testing Agency): Compressive strength of grout shall be determined by testing four cubes two inches in dimension according to the requirements of ASTM C109 "Compressive Strength of Hydraulic Cement Mortars". Each strength test shall be the average of two 28 day strengths. Test one cube at 7 days, 2 at 28 days, and one at 56 days only if either 28 day test is low.

B. Frequency of Testing: One set of cubes (4 cubes) shall be made for every ten base plates and bearing plates or fraction thereof but not less than one set for each day's operation. One set of cubes shall be made for each day's operation of grouting wall panels.

3.8 MASONRY

A. General: Masonry materials will be sampled through the use of Prism tests.

B. Prism Tests (by the Independent Testing Agency):

1. Scope: Prism tests will be made for each class of masonry (hollow masonry, grouted masonry, or composite masonry) on the project using an assembly of actual masonry units, mortar, and grout (if specified) as planned in the work.
2. Compressive Strength Test: Tests will be run according to the requirements of ASTM C 1314 "Test Methods for Compressive Strength of Masonry Prisms". Each strength test shall be defined as the average of three test prisms from the same class of masonry tested at 28 days.
3. Frequency of Testing:

    a. Non-Load Bearing Walls: One strength test will be run for each 5,000 square feet of wall or fraction thereof.

C. Experience Requirement: Field inspection of masonry construction by the Independent Testing Agency as herein described will be performed by qualified technicians with a minimum of three years experience in masonry testing and inspection.

D. Field Inspection Requirements: The duties and responsibilities of the Structural Masonry Inspector in the field will be as follows:

1. Review and become familiar with project drawings and specifications.
2. Review all masonry materials used in the field for conformance to project specifications. This will include masonry units, mortar, grout, portland cement, masonry cement, sand, lime, horizontal joint reinforcement, ties, masonry anchoring devices to the structure, and control joint strips.
3. Review proper horizontal joint reinforcement size and spacing. Review size and spacing of wall ties.
4. Review proper masonry construction practices for mortar including requirements for high and low lift grouting. Check conformance with hot and cold weather construction requirements.
5. Verify proper mortar batching proportions.
6. Confirm clean outs for high lift grouting.
7. Verify construction tolerances.
8. Review and confirm installation of reinforcing steel size, spacing, and splices in all walls, lintels, pilasters, and columns.

9. Confirm number and size of dowels in the foundation to walls and columns.
10. Take prism samples, or alternatively take mortar, grout and block samples, as specified above.

3.9 TRAFFIC AND WATERPROOFING DECK COATINGS

A. In-Place Testing (by Independent Testing Agency): Test each deck coating on slabs covering interior spaces for leaks immediately after nominal cure of completed traffic coatings, and prior to the installation of paver systems or topping slabs. Flood each area for 24 hours and examine underside of decks for evidence of leaks. Repair any leaks observed. Repeat test and make repairs until no leaks remain.

B. A minimum of one 1 in. square traffic coating sample will be taken for every 500 square feet of traffic coating installed. These samples will be removed prior to the application of the traffic coating topcoat. The dry film thickness of the traffic coating will be measured, and must be equal or greater than the thickness specified or recommended by the manufacturer, which ever is greater. If the traffic coating thickness is not satisfactory, additional coatings shall be installed at no added cost to the Owner. The traffic coating installer shall reapply traffic coating in areas disturbed by testing. Provide reports meeting the requirements of paragraph 1.5.G. which logs each test location and thickness of the coating.

C. Traffic coating shall have a minimum pull-off strength of 200 PSI, and shall be tested per ASTM D903 at a rate of one test per 500 square feet. Provide reports meeting the requirements of paragraph 1.5.G which logs each test location and results of the pull-off test.

3.10 JOINT SEALANTS

A. In-Place Testing:

1. Extent of Testing: Test completed sealant joints as follows:

    a. Perform one test for the first 1000 feet of joint length for each type of sealant and joint substrate.
    b.

2. Test Method: Test joint sealants by hand-pull method described below:

    a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193
    b. Procedure as described in ASTM C 1193 Appendix X1:

        1) Make a knife cut horizontally across the width of the sealant joint from one substrate of the joint to the other.
        2) Make two vertical cuts (downward starting at the horizontal cut) approximately 3-in. long, at both sides of the joint next to the substrates. Place a mark 1 inch from bonded edge.
        3) Grasp the 3-in. sealant tab firmly 1 in from its bonded edge and pull at a 90 degree angle. Reference figure X1.1 from ASTM C 1193 Appendix X1. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified

maximum movement capability in extension; hold this position for 10 seconds.

c. For joints with dissimilar substrates, check adhesion to each substrate separately. Do this by extending cut along one side, checking adhesion to opposite side, and then repeating this procedure for opposite side.

3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.
4. Inspect tested joints and report on the following:

   a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field- adhesion hand-pull test criteria.
   b. Whether sealants filled joint cavities and are free from voids.
   c. Whether sealant dimensions and configurations comply with specified requirements.

5. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
6. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that original sealant surfaces are clean and new sealant contacts original sealant.

B. Evaluation of Field-Test Results: If substrate adhesion is acceptable, the sealant should tear cohesively within itself or elongate to a manufacturer determined extension value from the 1 in gauge length indicated in 2.b.3 above, before releasing from either substrate adhesively. Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.11 FLOOD TESTING

A. Contractor’s Responsibility: In the presence and under the direction of the Testing Agency the contractor shall wet all test locations with water in order to detect any defects in the concrete which result in leaks and/or inadequate drainage. Surfaces shall be wetted until water flows freely to the drains.

B. Testing Locations: The following areas require flood testing:
   1. Exterior slabs covering interior spaces.
   2. Restrooms, recessed slabs and other similar spaces having interior area floor drains.
   3. Waterstop joints along both vertical and horizontal surfaces of existing and new construction.
   4. Expansion joints along both vertical and horizontal surfaces between the existing and new construction.

C. The Testing Agency will monitor the wetting of the interior and exterior slabs, waterstop joints, and expansion joints, and will inspect for the following deficiencies:

1. Low spots, puddles or bird baths are defined as an area of four square feet of standing water that has not drained with-in 45 minutes after applying water.
2. Joints include control, construction and expansion joints. Leaking joints are located by the observation of water on the underside of slabs and opposite faces of the walls. If the Expansion Joint is not installed at the time of the flood testing test this area separately. Leaking joints are repaired by replacing the sealant or expansion joint.
3. Cracks are located by observing water on the underside of the slab or as they are highlighted on the slab surface by remaining moisture as the surrounding slab dries.

D. The Testing Agency will use marking paint to mark all deficiencies noted in their inspection. They will also note each item and it's location in their report(s).

E. After repairs have been made by the Contractor the Testing Agency will re-inspect to verify that approved corrections have been completed in accordance with the documents and instructions of the Engineer. The cost of re-inspection shall be born by the Contractor.

END OF SECTION 014523